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1.0 PURPOSE AND SCOPE

(7.1.1.a, 7.1.1.b, 7.1.1.c, 7.1.1.d, 7.1.1.e, 7.1.1.f, 7.1.2.a, 7.1.2.b, 7.1.2.c, 7.1.2.d, 7.1.2.e, 7.1.3.a, 7.1.3.b, 7.1.3.c, 7.1.3.d, 7.1.4.a)

This process consists of initiation, development, and approval of equivalent replacement documents. An equivalent replacement allows the substitution of an item that is equivalent but is not identical to the original item. An equivalent replacement shall meet the same design requirements, perform the same function, and have the same interface requirements as the item being replaced. By imposing these requirements, an equivalent replacement ensures that the existing design function is not changed.

This procedure doesn't apply to equipment being replaced in accordance with design baseline changes (reference TFC-ENG-DESIGN-C-06).

This procedure applies to all Tank Operations Contractor (TOC) engineering organizations involved in controlling the design and maintaining the equipment associated with the tank farm facilities. This procedure applies to general service, safety significant, and safety class items. If the item must be upgraded from commercial grade for use in a safety significant or safety class application, the upgrade of the equivalent item is performed in accordance with the requirements specified in TFC-ENG-DESIGN-C-15.

2.0 IMPLEMENTATION

This procedure is effective on the date shown in the header.

3.0 RESPONSIBILITIES

Responsibilities are contained within Section 4.0.

4.0 PROCEDURE

4.1 General

1. An equivalent replacement may be required whenever one or more of the following occur:

   - Obsolescence of the item requires a new item be used,
   - Reliability of the item is questionable due to in-service failure records or industry/regulatory notices,
   - A part number change is initiated by the manufacturer,
   - A material change is made in the item by the manufacturer,
   - A design/function/performance change is made in the item by the manufacturer,
   - A substitution is made for the item by the manufacturer, or
   - Due to replacement cost or schedule.

2. Any document pertinent to the equivalent replacement, or prepared as a result of the equivalent replacement process, shall be listed in the equivalent replacement as an associated document.

3. See Figure 1 for process flow.

4.2 Equivalent Replacement Preparation and Approval

Responsible Engineer

1. Determine that an equivalent replacement is needed.

2. Initiate Equivalent Replacement Form (site form A-6003-188); obtain the form by opening a "NEW" Microsoft® Word file (located in the WRPS tab).

3. Determine the critical characteristics of the item and list them in Section 4 of the Equivalent Replacement Form. Use Attachments A and B as aids in identifying critical characteristics.

   NOTE: Critical characteristics for equivalency are to be functional in nature. The critical characteristics are the required characteristics for the item, which may be less restrictive than the actual characteristics of the original item.

4. Determine if an equivalent replacement document has already been generated for the same original item and whether it applies to the current need.

   a. If there is no existing equivalent replacement document for the same original item, proceed with Section 4.2, Step 5.

   b. If there is an existing equivalent replacement document, review to determine if it can be used for this application.

   c. If the existing equivalent replacement document applies (i.e., addresses the identical original item and application), no new equivalent replacement document is required. Exit this procedure, process an engineering change notice, if necessary, to change additional documentation, and proceed with procurement of the approved item.

   d. If the existing equivalent replacement document is applicable, but does not completely bound the new need (e.g., the current application or installation differs from the condition evaluated by the existing equivalent replacement document), proceed with Section 4.2, Step 5 using the existing equivalent replacement document as a resource, where possible.

5. Determine if there is a candidate replacement item available.

   a. If no candidate replacement items are identified, exit this procedure and initiate a facility modification type Engineering Change Notice (ECN) in accordance with TFC-ENG-DESIGN-C-06.

6. If a candidate replacement item was identified in Step 4 or 5, continue with the Equivalent Replacement Form and document the following to approve the replacement item:

   a. In Section 1 of the Equivalent Replacement Form, document the technical information for the original item, including manufacturer, supplier, manufacturer and supplier item number, specification, item description, and application description. Also document the reason for needing a replacement item. The application description in Section 1 provides the originator the opportunity to identify multiple locations/uses of the same item. This allows approval of the replacement item for use in several locations as long as the critical characteristics and qualification requirements are the same. This can make the equivalent replacement document applicable to multiple locations, eliminating the need to repeat the equivalent replacement process for those locations in the future.

   b. In Section 2 of the Equivalent Replacement Form, document the technical information for the candidate replacement item, including manufacturer, supplier, and manufacturer and supplier item numbers.

   c. Identify the safety classification and safety function(s) of the item being replaced and document this information in Section 3 of the Equivalent Replacement Form.

      - If the safety classification of the item is not already documented, determine the safety classification in accordance with the requirements specified in TFC-ENG-DESIGN-C-45.

   d. Perform an equivalency evaluation of the candidate item:

      - List the characteristics of the replacement item in Section 4 of the Equivalent Replacement Form and document how the potential replacement item's characteristics satisfy the critical characteristics of the original item.

- If testing is required to verify any of the critical characteristics are met, acquire and test the candidate item. The required testing and the test results are to be documented in Section 5 of the Equivalent Replacement Form.

NOTE: The only type of testing to be identified in Section 5 is special testing that is needed to verify that a critical characteristic is met, when that characteristic cannot be verified by any other means. This section should not identify any standard, functional testing that would always be performed to verify proper system/component function following maintenance (e.g., even after maintenance to repair or replace the original part). Such testing would be required by the work package, but it is not required specifically because the equivalency process is being used.

e. If any differences between the critical characteristics and the actual characteristics of the potential replacement item cannot be justified, that item is not equivalent and cannot be used; repeat step 6.d above until an acceptable replacement item has been found or until all candidate replacement items have been eliminated.

f. If no acceptable equivalent item can be found, initiate a design change to allow the installation of new equipment; discontinue the equivalent replacement process and initiate a facility modification type ECN in accordance with TFC-ENG-DESIGN-C-06.

7. When an equivalency evaluation is successfully completed for a replacement item:

a. If the item is commercial grade and will be used in a safety significant or safety class application, upgrade the item in accordance with TFC-ENG-DESIGN-C-15.

b. Check the field location for installation/mounting compatibility.

c. Provide in Section 6 of the Equivalent Replacement Form any appropriate installation guidance or special instructions (e.g., minor rerouting of tubing or wiring, etc.) to support work planning for the installation of the new item.

NOTE: As long as the new item has the same interface requirements (e.g., same air pressure or voltage/current), it is acceptable to allow minor differences in the orientation of the interface points (e.g., air or electrical connection locations).

d. Prepare a facility modification type ECN in accordance with TFC-ENG-DESIGN-C-06 for changes to any documents that

identify the item that is being replaced. The change should indicate that either the original item or the equivalent replacement item can be used in this location/application.

e. Prepare a change to the safety equipment list and/or the master equipment list to show the approved replacement part, in accordance with the requirements specified in TFC-ENG-FACSUP-C-23.

f. Complete preparation of the equivalent replacement document.

1) List references in Section 7 of the Equivalent Replacement Form (e.g., commercial grade item documentation).

2) Obtain an equivalent replacement document tracking number from the Hanford Document Numbering System (HDNS) database, and fill it in on the first page. The number will have the following format:

ER-YY-XXXX Revision -Z, where YY is the last two digits of the year, XXXX is the sequential number assigned from the database, and Z is the revision number (the original ER document will be revision 0).

3) On the remaining Equivalent Replacement Form pages and any supporting documentation that is attached, fill in the equivalent replacement and revision number that was identified on the first page.

4) List the attachments/supporting documents for the equivalent replacement document in Section 8 of the Equivalent Replacement Form.

5) Attach any supporting documentation (e.g., continuation pages, determination of safety classification). Apply the equivalent replacement document number to all included documentation.

8. Sign the equivalent replacement document.

Responsible Engineering Manager

9. Assign a primary reviewer.

Responsible Engineer

10. Identify the affected organizations, which are required to review portions of the equivalent replacement document that directly affect their organization or area of expertise.

a. Determine the required independent reviewers in accordance with TFC-ENG-DESIGN-C-25.

b. Determine the engineering approval authorities in accordance with TFC-PLN-03.

c. List the approval designators for the required review organizations in the "Approvals" block, Section 9, on the Equivalent Replacement Form.

11. Provide the equivalent replacement document to the reviewers.

Primary Reviewer

12. Review the equivalent replacement document and the ECNs for completeness, technical accuracy, and procedural compliance, resolving any concerns with the engineer who developed the equivalent replacement document.

NOTE: The primary reviewer must perform a complete review of the entire equivalent replacement document.

13. Verify that the resolution is within the scope of the equivalent replacement process.

14. When satisfied that the equivalent replacement document and ECNs are complete and acceptable, sign and return the equivalent replacement and other applicable documents to the responsible engineer.

Other Reviewers

15. Review the portions of the equivalent replacement document, which affect their organization, or area of expertise for completeness, technical accuracy, and adequate justification.

16. Resolve any comments with the responsible engineer.

17. Sign the equivalent replacement document and return it to the responsible engineer.

Responsible Engineering Manager

18. When satisfied that the equivalent replacement document and ECNs are complete and acceptable, and that the appropriate approval designators were identified, sign the equivalent replacement document and return it to the responsible engineer.

Responsible Engineer

19. Identify the distribution in Section 10 of the Equivalent Replacement Form and submit the equivalent replacement document to Document Service Center (Records Information Management - RIM) for release and distribution in accordance with TFC-ENG-DESIGN-C-25.

4.3 Equivalent Replacement Document Revisions

It may become necessary to change an equivalent replacement document after it has been issued (e.g., to include an ECN to change an affected document that was identified after the original equivalent replacement document was released). This section provides guidance for processing a revision.

Responsible Engineer

1. Fill out a new Equivalent Replacement Form.

   a. Duplicate the information from the original form for the item being replaced.

   b. Fill in the information for the replacement item.

   c. In the reason for "Needing Replacement Part" block, include an explanation of the need for this revision.

   d. Fill in the rest of the form indicating the information that is being changed in this revision.

   e. On each page, fill in the same number that was assigned to the original equivalent replacement document, but assign the next sequential revision number.

   f. Process the equivalent replacement document revision for review and approval in accordance with Section 4.2, steps 8 through 18.

2. Identify the required distribution in Section 10 of the Equivalent Replacement Form and submit the revised equivalent replacement document to Document Service Center (RIM) for release and distribution in accordance with TFC-ENG-DESIGN-C-25.

5.0 DEFINITIONS

Critical characteristics. Important design, material, and performance characteristics of a commercial grade item or service that, once verified, will provide reasonable assurance that the item or service will perform its intended safety function.

Equivalent replacement. An item that is equivalent but is not identical to the original item. The item may have different form, fit, or certain design characteristics, but, as a minimum, meets the same design basis requirements and performs the same function as the item being replaced. The replacement item also meets all applicable interface requirements of the original item.

Form. Those characteristics of an item that define the physical envelope (e.g., type or style of item, weight, material composition, and shape), design ratings, quality requirements, and code applicability associated with an item.

Function. The operation an item is required to perform to meet the component or system design basis, including passive operations, such as pressure containment.

Primary reviewer. The reviewer assigned to perform a complete review on the entire equivalent replacement document.

Responsible engineer. The responsible engineer is the individual defined per the Engineering Management Plan (TFC-PLN-03) (e.g., system engineer, project engineer, component engineer).

Responsible engineering manager. The responsible engineering manager is the individual defined per the Engineering Management Plan (TFC-PLN-03) (e.g., System Engineering manager, Engineering Technical Manager).

6.0 RECORDS

The following records are generated during the performance of the procedure.

- Equivalent Replacement Form (A-6003-188)
- Engineering Change Notice, if generated.

The record custodian identified in the Company Level Records Inventory and Disposition Schedule (RIDS) is responsible for record retention in accordance with TFC-BSM-IRM_DC-C-02.

7.0 SOURCES

7.1 Requirements

1. DOE-STD-1073-93, Guide for Operational Configuration Management Program, Part 1, and Guide for Operational Configuration Management Program, Part 2.
   a. I-B-4, "Change Control Element, Replacement Activities."
   b. I-B-7, "Material Condition and Aging Management Adjunct Program, Equipment Failures.
   c. 4.1.1, "Component Screening."
   d. 4.2.2, "Final Identification of Life-Limiting Components."
   e. 4.4.1, "Degradation Trending."
   f. "Design Topics, Maintenance Requirements."

2. DOE O 433.1, "Maintenance Management Program for DOE Nuclear Facilities."
   a. 4.a.3, "Work Control, Material Procurement and Handling."
   b. 4.a.6, "Graded Approach to the Configuration Management Process."
   c. Attachment 1, 1.c, "Work Control, Material Procurement and Handling."
   d. Attachment 1, 1.g, "Graded Approach to the Configuration Management Process."
   e. Attachment 1, 1.q.3, "Modification Work/Control of Equipment."

3. RPP-MP-003, "Integrated Environment, Safety, and Health Management System Description for the Tank Farm Contractor."

   a. ISMS Core Function 3 and Guiding Principles 5 & 6.

7.2 References

1. TFC-ENG-DESIGN-C-06, “Engineering Change Control.”

2. TFC-ENG-DESIGN-C-15, “Commercial Grade Dedication.”

3. TFC-ENG-DESIGN-C-25, “Technical Document Control.”

4. TFC-ENG-DESIGN-C-45, “Control development Process for Safety-Significant Structures, Systems, and Components.”

5. TFC-PLN-03, “Engineering Program Management Plan.”

Figure 1. Equivalent Replacement Process.

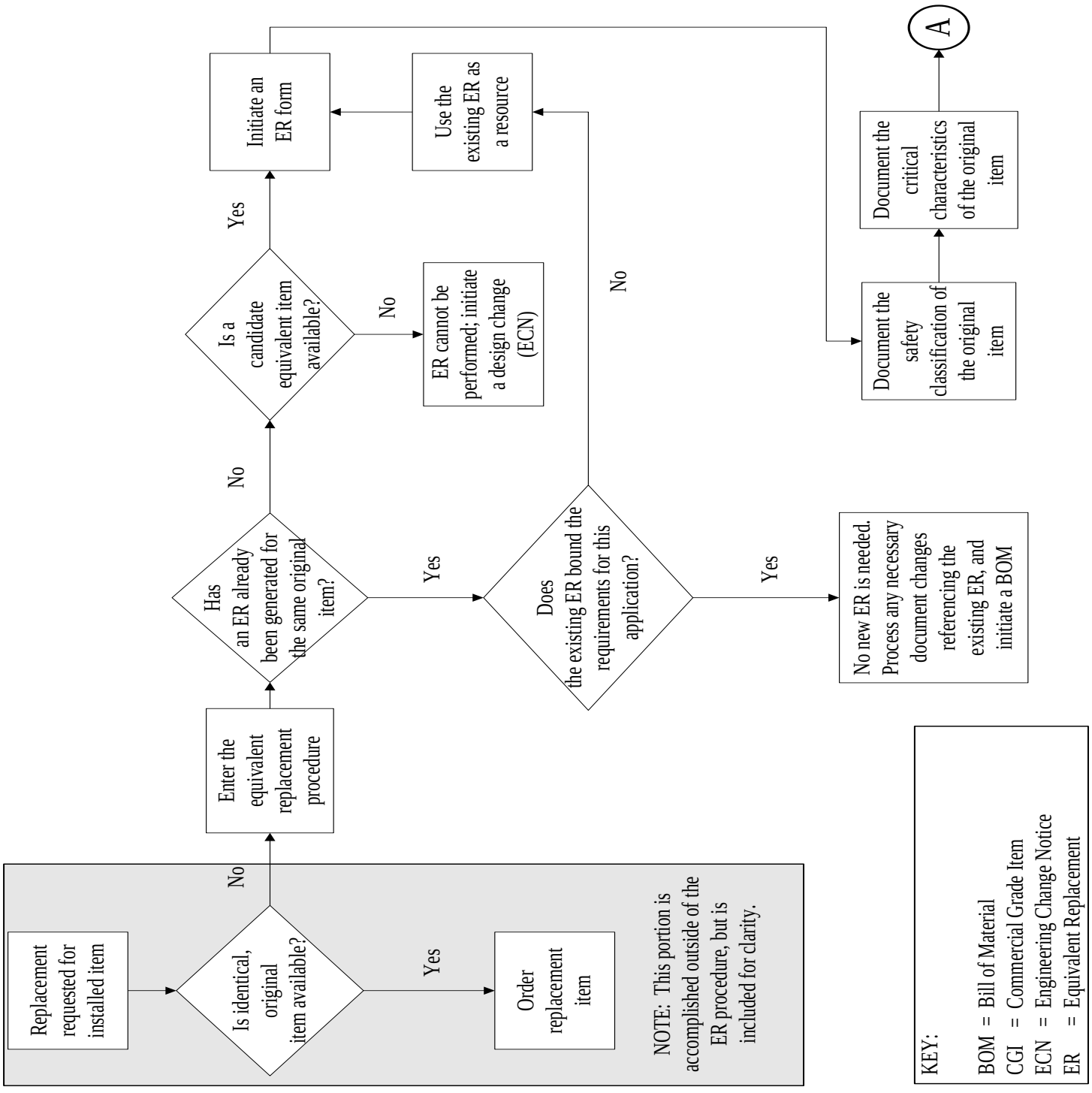
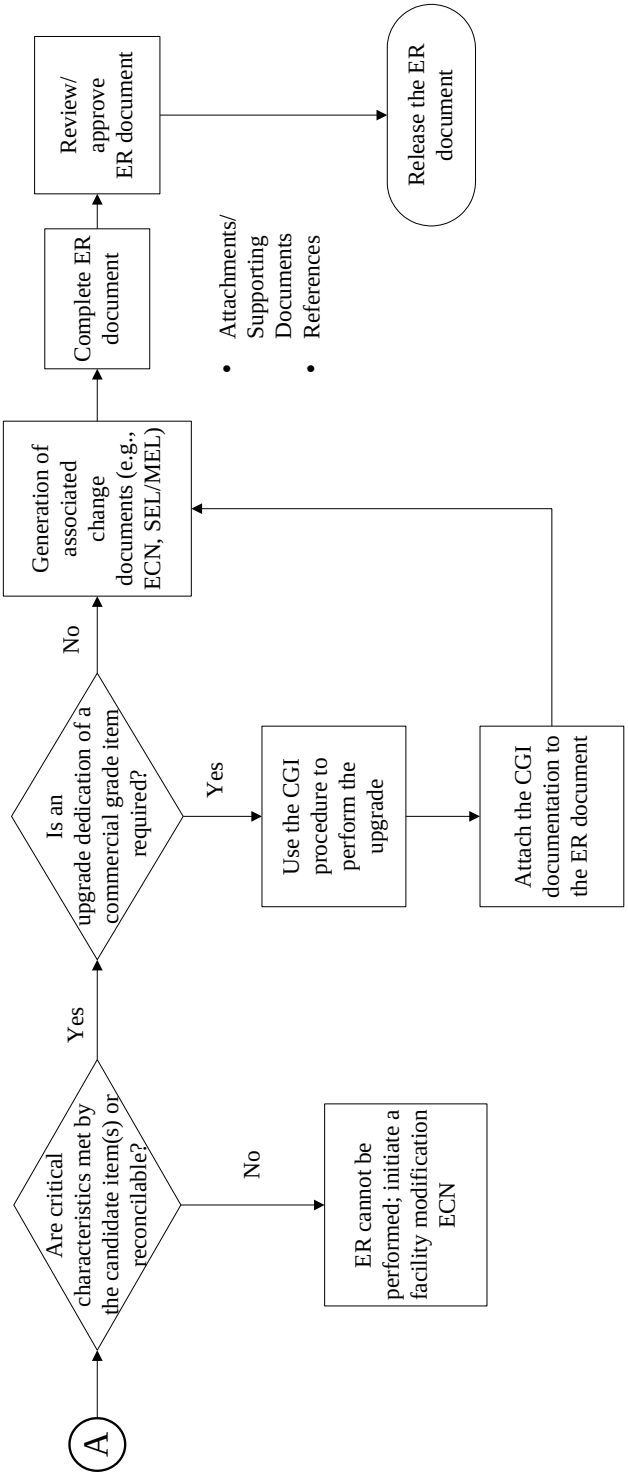


Figure 1. Equivalent Replacement Process. (cont.)



ATTACHMENT A – CRITICAL CHARACTERISTICS DETERMINATION AND EVALUATION

Determine critical characteristics as follows:

NOTE: Attachment B may be used to assist in determining critical characteristics for an item.

1. Identify the characteristics that are important to the original item's design and function.

2. The selected characteristics should be based on the complexity, intended function, and performance of the item.

3. The engineer shall include the following, as a minimum, in the documentation of the critical characteristics evaluation:

    a. The original item's bounding conditions for design and function.

    b. The original item's failure modes and effects that were used in determining any characteristics.

    c. The basis for the replacement item's compliance with the critical characteristics.

ATTACHMENT B – EXAMPLES OF CRITICAL CHARACTERISTICS

General Listing of Typical Critical Characteristics

Product Identification:

Color coding	Enclosure type	Nameplate data
Display type (scale, graduations)	Industry standard markings	Part number/unique identifier

Physical Characteristics:

Balance	Durometer hardness	Pour point
Capacitance	Elasticity	Purity
Cloud point	Fatigue resistance	Resilience
Coating	Flammability	Resistance
Color	Flashpoint	Solubility
Composite material hardness	General configuration/shape	Spring constant
Concentration	Homogeneity	Surface finish
Conductivity	Impedance	Surface hardness
Continuity	Inductance	Tensile strength
Density/Specific gravity	Leachable halogen content	Torque
Dielectric strength	Luminescence	Viscosity
Dimensions (to within manufacturer's tolerances)	Material of construction	Weight
Drop point	Plating	
Ductility	Polarity	

Performance Characteristics:

Accuracy	Interrupt rating	Pressure drop
Burn-in endurance	Interrupting current	Pressure rating
Chatter	Leakage	Repeatability
Current rating	Load rating	Ride Out
Cycle time	Open/closure time	Rotation direction
Deadband width	Operability (fail open/close, stroke)	Set point stability
Flow rate	Operating range	Speed
Gain	Performance during (no drift) under voltage conditions	Time/current response
Horsepower	Pick-up/drop-out voltage	Voltage rating
Input/output voltage	Power rating	

ATTACHMENT B – EXAMPLES OF CRITICAL CHARACTERISTICS (cont.)

Critical Characteristics for Generic Application Items

NOTE: This list is provided for illustration by example and is not intended to be all-inclusive or to exclude characteristics that may be deemed important by the engineer.

Item	Critical Characteristics
Bearing	Configuration, dimensions, load rating, material, model number
Bolting	Configuration, dimensions, pitch, material, tensile strength, hardness, plating
O-Ring	Dimensions, material, durometer hardness, elongation, leachable halogens
Terminal Block	Configuration, voltage rating, current rating, materials, dielectric strength
Crimped Terminal Connector	Configuration, material, dimensions (wire size, ring tong size), voltage rating, continuity, tensile pullout strength, color
Relay	Configuration, pick-up/drop-out voltage, voltage rating, current rating, chatter, response time
Fuse	Configuration, current rating, interrupt rating, time/current response, dimensions
Resistor	Configuration, markings, resistance, power rating
Drive Belt	Dimensions, cross-sectional shape, ride-out, fatigue resistance, load rating, material, tensile strength
Spiral Wound Gasket	Configuration, dimensions, markings, style number, materials (filler and windings), pressure rating, leachable halogens, special density
Cotter Pin	Configuration (point type), dimensions, material, finish, hardness
Pressure Switch	Configuration, dimensions, material (pressure retaining parts), voltage rating, response time, accuracy, nameplate data, pressure range, wire rating, enclosure type, dielectric strength (insulation), dead band width
Temperature Switch	Configuration, dimensions, material, voltage rating, response time, accuracy, nameplate data, temperature range, wire rating, enclosure type, dielectric strength (insulation), dead band width
Lubricating Grease/Oil	Color, specific gravity, viscosity, drop point, cone penetration, pour point, chemical composition, cloud point

ATTACHMENT B – EXAMPLES OF CRITICAL CHARACTERISTICS (cont.)

Critical Characteristics for Generic Application Items

Item	Critical Characteristics
Fuel Oil	Density, flash/cloud/pour points, kinematic viscosity, chemical composition, BTU rating
Framing Device	Configuration, shape, dimensions, material, tensile strength, coating
Materials (e.g., plate, angle)	Dimensions, shape, material, tensile strength, hardness, ductility, markings, coating
Valve Stem	Configuration, dimensions, material, tensile strength, ductility, finish, markings, hardness
Pump Impeller	Configuration, dimensions, material, hardness, balance, flow rate
Motor	Nameplate data (horsepower, speed, voltage), insulation class, frame size, materials, weight, shaft type, coupling type, bearing types, qualifications (seismic, environmental)
Nonmetallic Diaphragm (Valve Air Operator)	Configuration, dimensions, material, durometer hardness, reinforcement material, qualifications (seismic, environmental)
Solenoid Valve	Configuration, size, pressure rating, materials, voltage rating, current rating, coil class, open/ closure time, qualifications
Limit Switch	Configuration, dimensions, materials (metallic and nonmetallic), markings, operability, voltage rating, current rating, qualifications
Impeller Key	Configuration, dimensions, material, hardness
Spring (Relief Valve)	Configuration, dimensions (free length, coil diameter), spring rate, finish
Circuit Breaker	Nameplate date, dimensions, material, weight, accuracy, current rating, interrupt rating, interrupting current, open/close time, time current response, voltage rating, insulation resistance, voltage drop, qualification
Valve Packing Gland	Configuration, dimensions, material, tensile strength, hardness, finish
Filter Regulator Assembly (Pressure Control Valve)	Configuration, dimensions, materials, flow rate, pressure range, pressure rating, temperature rating, filter micron size

ATTACHMENT B – EXAMPLES OF CRITICAL CHARACTERISTICS (cont.)

Critical Characteristics for Generic Application Items

Item	Critical Characteristics
Pinion Gear	Configuration, dimensions, material, hardness, pitch
Crane Wheel Axle	Configuration, dimensions, material, tensile strength, hardness, finish
Shaft Coupling	Configuration, dimensions, materials, hardness
Anchor Bolt	Configuration, dimensions, material, wedge hardness, pitch, qualifications
Torque Switch	Configuration, dimensions, materials (metallic and nonmetallic), operability, qualifications
Pump Mechanical Seal Assembly	Configuration (completeness of assembly), materials, finish, leakage, leachable halogen content, dimensions
Valve Seal Ring	Configuration, material dimensions, finish, leakage
Integrated Circuit	Configuration, gain, input/output impedance, frequency responses, operability
Pressure Transmitter	Configuration, voltage rating, current output, pressure rating, materials, accuracy, qualifications
Control Switch	General configuration, contact configuration, voltage rating, current rating, materials, dimensions, operability
Transistor	Markings, gain, input/output impedance, current rating, voltage rating, operability